इंटरनेट मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 11067 (1984): Direct current standard resistors [ETD 12: Measuring Equipment for Basic Electrical Quantities]

"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

Act Number 22 of 2005
The Indian Parliament
RIGHT TO INFORMATION

Made Available By
Public.Resource.Org

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

(Reaffirmed 2002)

Indian Standard

SPECIFICATION FOR DC STANDARD RESISTORS

UDC 621·316·8·024

© *Copyright* 1985

INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Gr 2 *January* 1985

Indian Standard

SPECIFICATION FOR DC STANDARD RESISTORS

Electrical Measuring Instruments Sectional Committee, ETDC 48

Chairman

PROF J. K. CHOUDHURY
Jadavpur University,
Calcutta

Members	*Representing*
SHRI A. K. BARMAN	The Calcutta Electric Supply Corporation (I) Ltd, Calcutta
SHRI S. B. MUKHOPADHYAY (*Alternate*)	
SHRI A. K. BASAK	Development Commissioner, Small Scale Industries (Ministry of Industry), New Delhi
SHRI A. N. SAHAI (*Alternate*)	
SHRI V. K. BATRA	National Physical Laboratory (CSIR), New Delhi
SHRI K. P. BHATNAGAR	Directorate of Standardization, Ministry of Defence (R & D Organization), New Delhi
SHRI B. M. SHANKAR PRASAD (*Alternate*)	
SHRI J. C. COLACO	Larson & Toubro Ltd, Bombay
SHRI J. J. DARUWALA	All India Instruments Manufacturers & Dealers' Association, Bombay
SHRI C. P. GOLIYA (*Alternate*)	
SHRI B. P. GHOSH	National Test House, Calcutta
SHRI B. MUKHOPADHYAYA (*Alternate*)	
SHRI NARENDRA GOLIYA	Shanti Electric Instruments, Bombay
SHRI H. S. SAWARKAR (*Alternate*)	
SHRI K. V. GOPALARATNAM	Institute for Design of Electric Measuring Instruments, Bombay
SHRI B. V. VARDARAJAN (*Alternate*)	
JOINT DIRECTOR STANDARDS (ELECTRICAL)-6	Research Design & Standards Organisation, Ministry of Railways, Lucknow
ASSISTANT DESIGN ENGINEER (ELECTRICAL)-C1 (*Alternate*)	
SHRI M. R. KATARIA	Central Scientific Instruments Organization (CSIR), Chandigarh
SHRI S. S. KULKARNI	Automatic Electric Ltd, Bombay
SHRI O. P. PURI (*Alternate*)	

(*Continued on page* 2)

© *Copyright* 1985
INDIAN STANDARDS INSTITUTION
This publication is protected under the *Indian Copyright Act* (XIV of 1957) and reproduction in whole or in part by any means except with written permission of the publisher shall be deemed to be an infringement of copyright under the said Act.

(*Continued from page* 1)

Members	*Representing*
Shri Lakshmi Sagar	The Oriental Science Apparatus, Ambala
Shri K. S. Gupta (*Alternate*)	
Shri P. T. Lendhe	The Bombay Electric Supply & Transport Undertaking, Bombay
Shri M. A. Karim (*Alternate*)	
Shri M. M. Lohia	Siemens India Ltd, Bombay
Shri A. H. Thakore (*Alternate*)	
Shri S. C. Maheshwari	Toshniwal Industries Pvt Ltd, Ajmer
Shri B. Singh (*Alternate*)	
Shri D. B. Malik	Directorate General of Technical Development, New Delhi
Shri B. N. Das (*Alternate*)	
Shri N. Narayana	Directorate General of Inspection, Ministry of Defence (DGI), New Delhi
Shri D. P. Dhiman (*Alternate*)	
Shri Narinderjit Singh	Directorate of Industries Punjab, Chandigarh
Shri Parminder Singh (*Alternate*)	
Shri S. Sharma	Sharmason's Sakova Instruments (P) Ltd, New Delhi
Shri G. K. Sinha	Directorate General of Supplies & Disposals (Inspection), New Delhi
Shri Anil Gupta (*Alternate*)	
Shri T. Somasundram	Directorate of Industries & Commerce, Madras
Shri M. Rajagopalan (*Alternate*)	
Shri K. Thangaraj	The Motwane Manufacturing Co Pvt Ltd, Nasik Road
Shri R. Venkateswaran (*Alternate*)	
Shri Rakesh Verma	Instrumentation Ltd, Kota
Shri S. Nogi (*Alternate*)	
Shri R. Viswanathan	Directorate General of Posts & Telegraphs, Department of Communication, Jabalpur
Shri T. S. Vasudevan (*Alternate*)	
Shri M. S. Wandalkar	Bharat Heavy Electricals Ltd, Bhopal
Shri S. K. Kasliwal (*Alternate*)	
Shri S. P. Sachdev, Director (Elec Tech)	Director General, ISI (*Ex-officio Member*)

Secretary

Shri B. K. Mahata
Senior Deputy Director (Elec Tech), ISI

Indian Standard

SPECIFICATION FOR DC STANDARD RESISTORS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 11 October 1984, after the draft finalized by the Electrical Measuring Instruments Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard covers the requirements of dc standard resistors which are used to establish the values of other resistors and for reference purposes in the calibration of apparatus comprising resistors. Standard resistors shall be resistors of the highest quality, whose resistance is closely adjusted to some standard nominal value having accuracy between 0·1 percent and 0·005 percent and whose stability is assured by proper design and construction.

0.3 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard covers the requirements of dc standard resistors assembled from resistance material in enclosure for laboratory and commercial use and for comparison and reference purpose.

1.2 It covers standard resistors within a range of 100 micro ohms to 1 megohms, having accuracies between 0·1 percent and 0·005 percent (both inclusive).

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

---

*Rules for rounding off numerical values (*revised*).

2.1 Standard Resistors — Resistors used as a standard or for reference purpose. This may be 2 terminals or 4 terminals type, air cooled or oil-cooled.

2.2 Resistor — An assembly of conductors which is used specially because of its resistance.

2.3 Temperature Co-efficient — The change in magnitude of any property of a substance (such as its resistance) caused by a rise of one degree celsius in temperature, and expressed as a fraction of the magnitude at some defined temperature adopted as a standard.

2.4 Terminal — That portion of a circuit or piece of apparatus which is intended for the reception of conductors by means of which it may be connected electrically to another circuit or piece of apparatus.

2.4.1 *Two-Terminal Resistor* — A resistor having a single combined current-potential terminal at each end.

2.4.2 *Four-Terminal Resistor*

2.4.2.1 *Current terminal* — Two terminals of standard resistors at each end for current carrying circuit.

2.4.2.2 *Potential terminal* — Two terminals of standard resistors for connection to a potential measuring circuit.

NOTE — The value of the resistance is defined as the quotient of the potential difference between the two potential terminals to the current entering and leaving the current terminals, provided that no current is drawn from the potential terminals.

2.5 Thermo-emf — The electromotive force due to a thermo-electric effect.

2.5.1 *Thermo-electric Effect* — An effect that an emf arises due to a difference of temperature between two junctions of dissimilar materials in the same circuit.

2.6 Influence Quantity — A quantity, other than the measured quantity which is liable to cause unwanted variation.

2.7 Variation with Influence Quantity — The difference between two measured values when an influence quantity assumes successively two different specified values.

2.8 Reference Conditions — The specified condition under which the standard resistor meets the specified value.

2.9 Type Tests — Tests carried out to prove conformity with the specification. These are intended to prove the general quantities and design of a given type of resistors.

2.10 Routine Tests — Tests carried out on each type resistor to check requirements which are likely to vary during production.

3. ACCURACY CLASS

3.1 Standard resistors specified in this standard are classified according to their accuracy classes as follows:

a) 0·005, 0·01, 0·05, 0·1; and

b) 50 PPM, 100 PPM, 500 PPM, 1 000 PPM.

The accuracy of a standard resistors may be expressed either in percentage using (a) or in PPM using, (b) or both.

4. MATERIALS

4.1 The resistors shall be constructed from resistance material, having a negligible temperature coefficient of resistance and negligible thermo-emf against copper. The coils, after being wound, shall be thoroughly aged.

4.1.1 Materials used in the construction shall be adequate protected against oxidation and corrosion and shall have adequate mechanical strength.

5. WORKMANSHIP AND FINISH

5.1 The apparatus shall be robust in construction. It shall present a good finish. Paint, lacquering or any other surface finish shall be hard and smooth so that cleaning of accumulated dust shall be facilitated.

5.2 All the resistors shall be treated to be moisture resistant.

5.2.1 All exposed terminals shall be treated to withstand oxidation and corrosion.

5.3 Soldering and brazing shall preferably be done with non-corrosive flux. When a corrosive flux is used, it shall be completely recovered. Soldered joints shall present a smooth and continuous appearance. All excess solder and flux shall be removed.

5.4 The container cover should have a suitable opening for pouring oil into the container and for putting thermometer.

5.5 Current terminals should be of adequate cross-section so that they are not excessively heated while carrying maximum rated current.

5.6 Spring washers and lock nuts or similar devices should preferably be used especially for fixing binding posts so that they do not become loose on repeated turning and twisting.

5.7 A certificate of tests shall also be provided by the manufacturer, as agreed to between the purchaser and the supplier.

6. MARKING

6.1 The following information shall be marked on the exposed panel or nameplate:

a) Nominal value and accuracy class of the resistor at 27°C,

b) Maximum current rating,

c) Manufacturers' name or trade-mark,

d) Serial number and type number of the resistor, and

e) Country of manufacture.

6.2 Terminals shall be clearly and indelibly marked either by recognised electrical symbols or by lettering, where required.

6.3 The maximum allowable current through or voltage across individual, coils, shall be clearly indicated either by indelible marking on the exposed panel or by mentioning in any booklet accompanying the resistor. It is usual practice to state power rating of resistance in air and/or oil.

6.3.1 It is preferable to give two critical values of current as follows:

a) The measuring current at 27 ± 2°C up to which the resistors shall remain within their specified accuracy class, and

b) The maximum current value which the resistor is capable of carrying without any damage to the unit.

6.4 The apparatus may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

7. TESTS

7.1 Routine Tests — The following shall constitute the routine test:

a) Insulation resistance test (**7.3**),

b) High voltage test (**7.4**), and

c) Accuracy test (**7.5**).

7.2 Type Tests — The following shall constitute the type test:

a) Insulation resistance test (**7.3**),

b) High voltage test (**7.4**),

c) Accuracy test (**7.5**),

d) Temperature variation test (**7.6**),

e) Thermo-emf with copper test (for standard resistance of accuracy 0·005 percent and 0·1 percent only) (**7.7**),

f) Temperature cycle test (**7.8**),

g) Damp heat (cyclic) test (**7.9**), and

h) Vibration and shock test (**7.10**).

7.3 Insulation Resistance Test — Insulation resistance between terminal and enclosure shall be at least 10^5 times, the value of resistance of the resistor at 500 ± 50 volt dc.

7.4 High Voltage Test — No break down, arcing or sparking shall occur when 2 000 volts rms is applied between terminals and enclosure for a period of one minute.

7.5 Accuracy Test — It is recommended for that measuring the value of standard resistance, the accuracy of the measuring apparatus shall be 2 times better than the accuracy of the standard resistance of 0·005 and 0·01 percent grade and 5 times better than other grades. This may be carried out at any value of the current up to the rated current through the standard resistor.

7.5.1 The test shall be carried out at reference condition specified or as given below:

Temperature 27 ± 2°C

Humidity 40 to 70 RH

7.6 Temperature Variation Test — The value of the resistance measured shall be remeasured at temperature 10°C higher and 10°C lower than the specified temperature and the variation of resistance for this change shall be within the variation given by a temperature co-efficient of 0·000 02 for 1°C in case of accuracy class 0·005 to 0·01 and 0·000 05 for 1°C for other accuracy class. Resistance values as measured in this range shall be within the limits of error.

7.7 Thermo-emf With Copper Test — (For the standard resistance of 0·005 percent and 0·01 percent accuracy.) Thermo-emf of the resistance material used in the resistance shall be measured against copper and shall not be greater than 2 microvolt per degree celcius of temperature difference between the cold and hot junction.

7.8 Temperature Cycle Test — The resistor shall operate without incurring permanent damage and also satisfy the requirements of **7.5** when subjected to the temperature cycle as given in **6.5.3** of IS : 1248 (Part 1)-1983* for the temperature cycle limits —10°C to +55°C.

7.9 Damp Heat (Cyclic) Test — The test shall be carried out as given in IS : 9000 (Part 5/Sec 1)-1981† for 16·8h cycle with number of cycles 2 and recovery period of 24 hours.

7.10 Vibration and Shock Test — Provisions of **7.6** of IS : 1248 (Part 1)-1983* shall apply.

---

*Direct acting indicating analogue electrical measuring instruments and their accessories: Part 1 General requirements (*second revision*).

†Basic environmental testing procedures electronic and electrical items: Part 5 Damp heat (cyclic) test.